1   What is claimed is:

2

3   1.   A method of producing reduced-quality MPEG coded video from original-

4   quality MPEG coded video, the original-quality MPEG coded video including a set of

5   non-zero AC discrete cosine transform (DCT) coefficients for 8x8 blocks in frames of the

6   original-quality MPEG coded video, the reduced-quality MPEG coded video also having

7   frames of 8x8 blocks, each frame in the reduced-quality MPEG coded video having a

8   corresponding frame in the original-quality MPEG coded video, and each 8x8 block in

9   each frame of the reduced-quality MPEG coded video having a corresponding block in a

10   corresponding frame in the original-quality MPEG coded video, said method comprising

11   the steps of:

12   selecting non-zero AC DCT coefficients from corresponding blocks in the

13   original-quality MPEG coded video to be included in the blocks of the reduced-quality

14   MPEG coded video so that each 8x8 block in each frame of the reduced-quality MPEG

15   coded video has a number of bits encoding non-zero AC DCT coefficients that is

16   generally proportional to the number of bits encoding non-zero AC DCT coefficients for

17   the corresponding 8x8 block in the corresponding frame of original-quality MPEG coded

18   video.

19

20   2.   The method as claimed in claim 1, which includes computing a number of

21   bits available for encoding the non-zero AC DCT coefficients in said each of the 8x8

22   blocks in each frame of the reduced-quality MPEG coded video, the number of bits

23   available for encoding being computed by scaling the number of bits encoding non-zero

24   AC DCT coefficients in the corresponding block of the corresponding frame of the

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1   original-quality MPEG coded video by a scale factor for said each frame, the scale factor

2   being selected to obtain a desired reduced bit rate in the MPEG coded video for said each

3   frame.

4

5   3.   The method as claimed in claim 2, which includes computing a moving

6   average of frame size of the frames in the original-quality MPEG coded video, and

7   computing the scale factor for said each frame from the moving average of frame size

8   and a desired frame size for the reduced-quality MPEG coded video.

9

10   4.   The method as claimed in claim 2, which includes computing a difference

11   between the number of bits available for encoding the non-zero AC DCT coefficients in

12   said each of the 8x8 blocks in each frame of the reduced-quality MPEG coded video and

13   the number of bits used for encoding the non-zero AC DCT coefficients retained in said

14   each of the 8x8 blocks in each frame of the reduce-quality MPEG coded video, and

15   making available for encoding non-zero AC DCT coefficients of following blocks said

16   difference between the number of bits.

17

18   5.   The method as claimed in claim 4, which includes accumulating said

19   difference to produce an accumulated number of bits that were available for encoding

20   non-zero AC DCT coefficients in prior 8x8 blocks of the reduced-quality MPEG coded

21   video but were not used for encoding non-zero AC DCT coefficients in the prior 8x8

22   blocks of the reduced-quality MPEG coded video, and making said accumulated number

23   of bits available for encoding non-zero AC DCT coefficients in a certain number of

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1   following blocks in the reduced-quality MPEG coded video by dividing said accumulated

2   number of bits by said certain number of following blocks to compute a fraction of the

3   accumulated number of bits that is available for encoding said each of the 8x8 blocks of

4   said each frame of the reduced-quality MPEG coded video in addition to the number of

5   bits computed by scaling the number of bits encoding non-zero AC DCT coefficients in

6   the corresponding block of the corresponding frame of the original-quality MPEG coded

7   video by the scale factor for said each frame.

8

9   6.   The method as claimed in claim 5, wherein said certain number of blocks

10   is substantially equal to the number of blocks in said each frame, so that bits that are

11   available but not used for encoding the AC DCT coefficients for the blocks in said each

12   frame are made available for encoding the AC DCT coefficients for the blocks in a

13   following frame.

14

15   7.   The method as claimed in claim 1, which includes computing a difference

16   between a number of bits available for encoding the non-zero AC DCT coefficients in

17   said each of the 8x8 blocks in each frame of the reduced-quality MPEG coded video and

18   the number of bits used for encoding the non-zero AC DCT coefficients retained in said

19   each of the 8x8 blocks in each frame of the reduce-quality MPEG coded video, and

20   making said difference available for encoding non-zero AC DCT coefficients of

21   following blocks.

22

1   8.   The method as claimed in claim 7, which includes accumulating said

2   difference to produce an accumulated number of bits that were available for encoding

3   non-zero AC DCT coefficients in prior 8x8 blocks of the reduced-quality MPEG coded

4   video but were not used for encoding non-zero AC DCT coefficients in the prior 8x8

5   blocks of the reduced-quality MPEG coded video, and making said accumulated number

6   of bits available for encoding non-zero AC DCT coefficients in a certain number of

7   following blocks.

8

9   9.   The method as claimed in claim 8, wherein said accumulated number of

10   bits is made available for encoding non-zero AC DCT coefficients in a certain number of

11   following blocks of the reduced-quality MPEG coded video by dividing said accumulated

12   number of bits by said certain number of following blocks of the reduced-quality MPEG

13   coded video to compute a fraction of the accumulated number of bits that is available for

14   encoding non-zero AC DCT coefficients in said each of the 8x8 blocks of the reduced-

15   quality MPEG coded video in addition to the number of bits computed by scaling the

16   number of bits encoding non-zero AC DCT coefficients in the corresponding block of the

17   corresponding frame of the original-quality MPEG coded video by the scale factor for

18   said each frame.

19

20   10.   The method as claimed in claim 8, wherein said certain number of

21   following blocks is substantially equal to the number of blocks in a frame, so that bits

22   that are available but not used for encoding the AC DCT coefficients for the blocks in

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1   said each frame are made available for encoding the AC DCT coefficients for the blocks

2   in a following frame.

3

4   11.   A method of producing reduced-quality MPEG coded video from original-

5   quality MPEG coded video, the original-quality MPEG coded video including a set of

6   non-zero AC discrete cosine transform (DCT) coefficients for 8x8 blocks in frames of the

7   original-quality MPEG coded video, the reduced-quality MPEG coded video also having

8   frames of 8x8 blocks, each frame in the reduced-quality MPEG coded video having a

9   corresponding frame in the original-quality MPEG coded video, and each 8x8 block in

10   each frame of the reduced-quality MPEG coded video having a corresponding block in a

11   corresponding frame in the original-quality MPEG coded video, said method comprising,

12   for each block in the reduced-quality MPEG coded video, the steps of:

13   (a) determining the number of bits used in encoding non-zero AC DCT

14   coefficients in the corresponding block of original-quality MPEG coded video;

15   (b) computing a number of bits available for encoding AC DCT coefficients in the

16   original-quality MPEG coded video by scaling the number of bits used in encoding non-

17   zero AC DCT coefficients in the corresponding block of original-quality MPEG coded

18   video with a scale factor; and

19   (c) selecting non-zero AC DCT coefficients in a certain order from the

20   corresponding block in the original-quality MPEG coded video to be included in said

21   each block of the reduced-quality MPEG coded video until the number of bits available

22   for encoding the AC DCT coefficients in the block in the reduced-quality encoded video

23   is not sufficient for encoding, in the block of the reduced-quality MPEG coded video, any

1   more of the AC DCT coefficients in the corresponding block of original-quality MPEG

2   coded video.

3

4   12.   The method as claimed in claim 11, wherein said order is a parsing order

5   of the non-zero AC DCT coefficients in the corresponding block in the original-quality

6   MPEG coded video.

7

8   13.   The method as claimed in claim 11, which includes computing the scale

9   factor from a bit rate of the original-quality MPEG coded video and a desired bit rate for

10 the reduced-quality MPEG coded video.

11

12   14.   The method as claimed in claim 11, which includes computing the scale

13 factor for each frame of the reduced-quality MPEG coded video from a moving average

14 of the size of the corresponding frames in the original-quality MPEG coded video and a

15 desired frame size for the reduced-quality MPEG coded video.

16

17   15.   The method as claimed in claim 11, which includes computing a

18 difference between the number of bits available for encoding the non-zero AC DCT

19 coefficients in said each of the 8x8 blocks in each frame of the reduced-quality MPEG

20 coded video and the number of bits used for encoding the non-zero AC DCT coefficients

21 retained in said each of the 8x8 blocks in each frame of the reduce-quality MPEG coded

22 video, and making available for encoding non-zero AC DCT coefficients of following

23 blocks said difference between the number of bits.

16.   The method as claimed in claim 15, which includes accumulating said difference to produce an accumulated number of bits that were available for encoding non-zero AC DCT coefficients in prior 8x8 blocks of the reduced-quality MPEG coded video but were not used for encoding non-zero AC DCT coefficients in the prior 8x8 blocks of the reduced-quality MPEG coded video, and making said accumulated number of bits available for encoding non-zero AC DCT coefficients in a certain number of following blocks in the reduced-quality MPEG coded video by dividing said accumulated number of bits by said certain number of following blocks to compute a fraction of the accumulated number of bits that is available for encoding said each of the 8x8 blocks of said each frame of the reduced-quality MPEG coded video in addition to the number of bits computed by scaling the number of bits encoding non-zero AC DCT coefficients in the corresponding block of the corresponding frame of the original-quality MPEG coded video by the scale factor for said each frame.

17.   The method as claimed in claim 16, wherein said certain number of following blocks is substantially equal to the number of blocks in said each frame, so that bits that are available but not used for encoding the AC DCT coefficients for the blocks in said each frame are made available for encoding the AC DCT coefficients for the blocks in a following frame.

18.   A method of producing in real-time a stream of reduced-quality MPEG-2 coded video from a source of original-quality MPEG-2 coded video, the original-quality

1 MPEG-2 coded video including a set of non-zero AC discrete cosine transform (DCT)

2 coefficients for 8x8 blocks in frames of the original-quality MPEG-2 coded video, the

3 reduced-quality MPEG-2 coded video also having frames of 8x8 blocks, each frame in

4 the reduced-quality MPEG-2 coded video having a corresponding frame in the original-

5 quality MPEG-2 coded video, and each 8x8 block in each frame of the reduced-quality

6 MPEG-2 coded video having a corresponding block in a corresponding frame in the

7 original-quality MPEG-2 coded video, said method comprising, for each frame in the

8 reduced-quality MPEG-2 coded video, the steps of:

9   (a) computing a moving average of the size of the corresponding frame in the

10 original-quality MPEG-2 coded video;

11   . (b) computing a scale factor from the moving average of the size of the

12 corresponding frame in the original-quality MPEG-2 coded video and a desired size of

13 said each frame of the reduced-quality MPEG-2 coded video; and

14   (c) for each 8x8 block in said each frame:

15   (i) determining the number of bits used in encoding non-zero AC DCT

16 coefficients in the corresponding block of original-quality MPEG-2 coded video;

17   (ii) computing a number of bits available for encoding AC DCT

18 coefficients in the original-quality MPEG-2 coded video by scaling the number of

19 bits used in encoding non-zero AC DCT coefficients in the corresponding block

20 of original-quality MPEG-2 coded video with a scale factor, and

21   (iii) selecting non-zero AC DCT coefficients in a parsing order from the

22 corresponding block in the original-quality MPEG-2 coded video to be included

23 in said each block of the reduced-quality MPEG-2 coded video until the number

1 of bits available for encoding the AC DCT coefficients in the block in the

2 reduced-quality encoded video is not sufficient for encoding, in the block of the

3 reduced-quality MPEG-2 coded video, any more of the AC DCT coefficients in

4 the corresponding block of original-quality MPEG-2 coded video.

5

6   19.   The method as claimed in claim 18, which includes computing a

7 difference between the number of bits available for encoding the non-zero AC DCT

8 coefficients in said each of the 8x8 blocks in each frame of the reduced-quality MPEG

9 coded video and the number of bits used for encoding the non-zero AC DCT coefficients

10 retained in said each of the 8x8 blocks in each frame of the reduce-quality MPEG coded

11 video, and making available for encoding non-zero AC DCT coefficients of following

12 blocks said difference between the number of bits.

13

14   20.   The method as claimed in claim 19, which includes accumulating said

15 difference to produce an accumulated number of bits that were available for encoding

16 non-zero AC DCT coefficients in prior 8x8 blocks of the reduced-quality MPEG coded

17 video but were not used for encoding non-zero AC DCT coefficients in the prior 8x8

18 blocks of the reduced-quality MPEG coded video, and making said accumulated number

19 of bits available for encoding non-zero AC DCT coefficients in a certain number of

20 following blocks in the reduced-quality MPEG coded video by dividing said accumulated

21 number of bits by said certain number of following blocks to compute a fraction of the

22 accumulated number of bits that is available for encoding said each of the 8x8 blocks of

23 said each frame of the reduced-quality MPEG coded video in addition to the number of

1   bits computed by scaling the number of bits encoding non-zero AC DCT coefficients in

2   the corresponding block of the corresponding frame of the original-quality MPEG coded

3   video by the scale factor for said each frame.

4

5   21.   The method as claimed in claim 20, wherein said certain number of blocks

6   is substantially equal to the number of blocks in said each frame, so that bits that are

7   available but not used for encoding the AC DCT coefficients for the blocks in said each

8   frame are made available for encoding the AC DCT coefficients for the blocks in a

9   following frame.

10

11